



Learning Math through peer interaction and intelligent machines

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Introduction

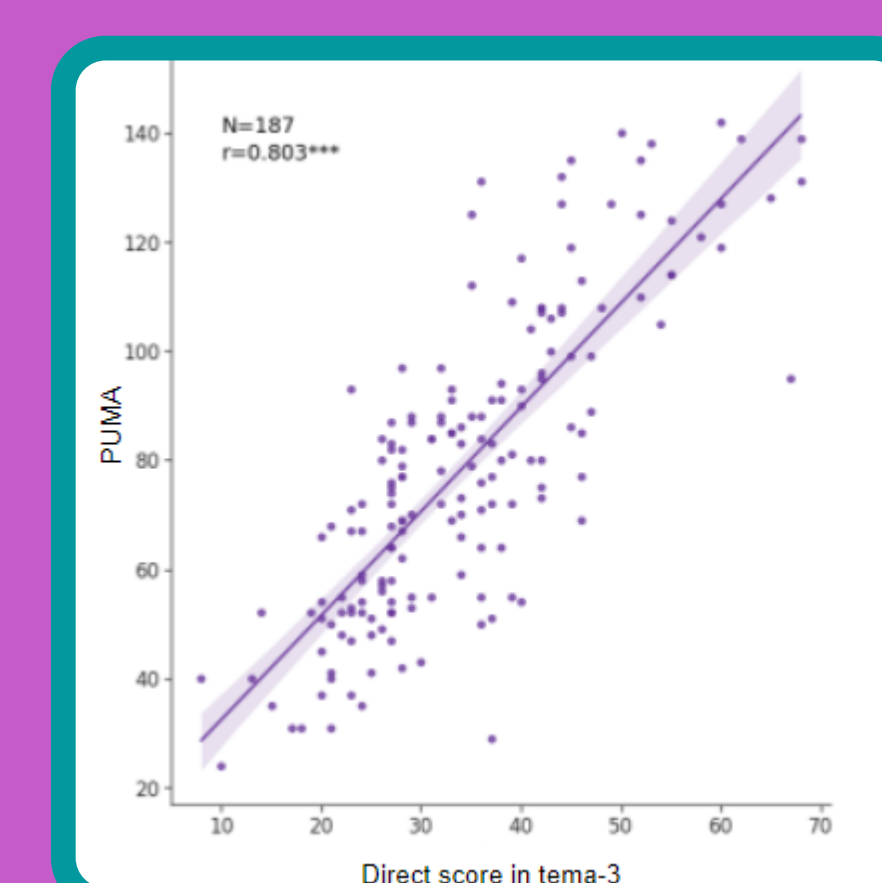
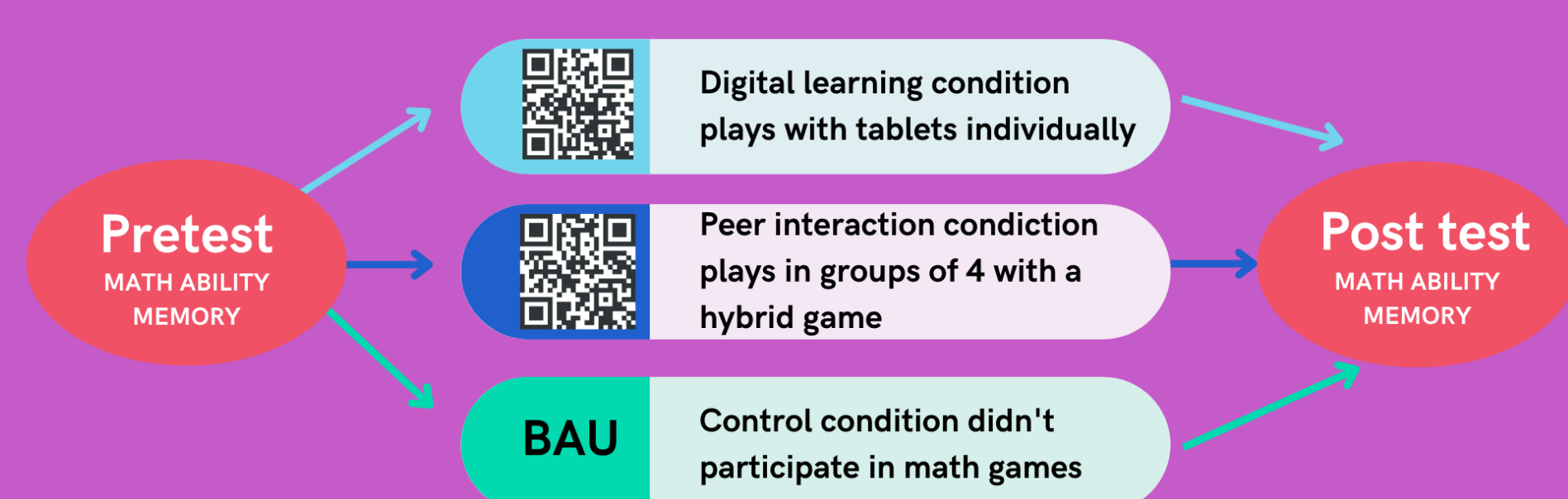
Math games are a good tool to enhance mathematical knowledge (Pan, Ke & Xu, 2022). Both digital learning games (DLG) as well as physical games (PG) have been widely studied and have been shown to be effective in math learning (Tokac, Novak, & Thompson, 2019; Yusof, & Shahrill, 2021).

The dynamics of the game can also vary, while in some games children play individually, other games encourage peer interaction (Thai, Bang, & Li, 2022).

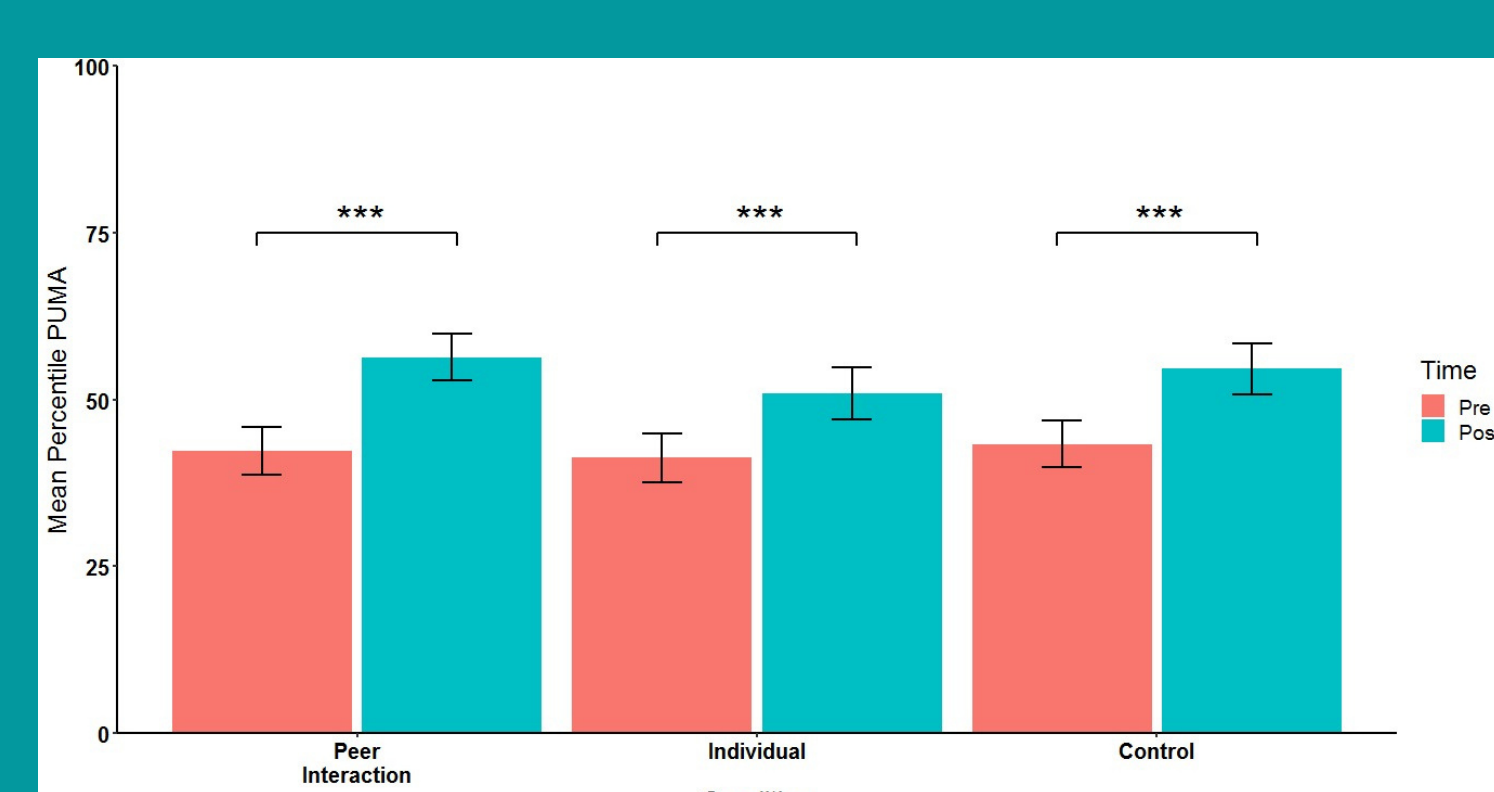
The study

Based on previous literature (Dillon et al., 2017), we design a math intervention in senior kindergarten (n=97) and first grade (n=64). A math game was used in two different dynamics: (1) a peer interaction condition and (2) a digital individual condition. We hypothesized that the peer interaction condition would improve more in early math skills than the individual condition and this, in turn, would improve in relation to the business as usual condition (BAU).

Method & Results

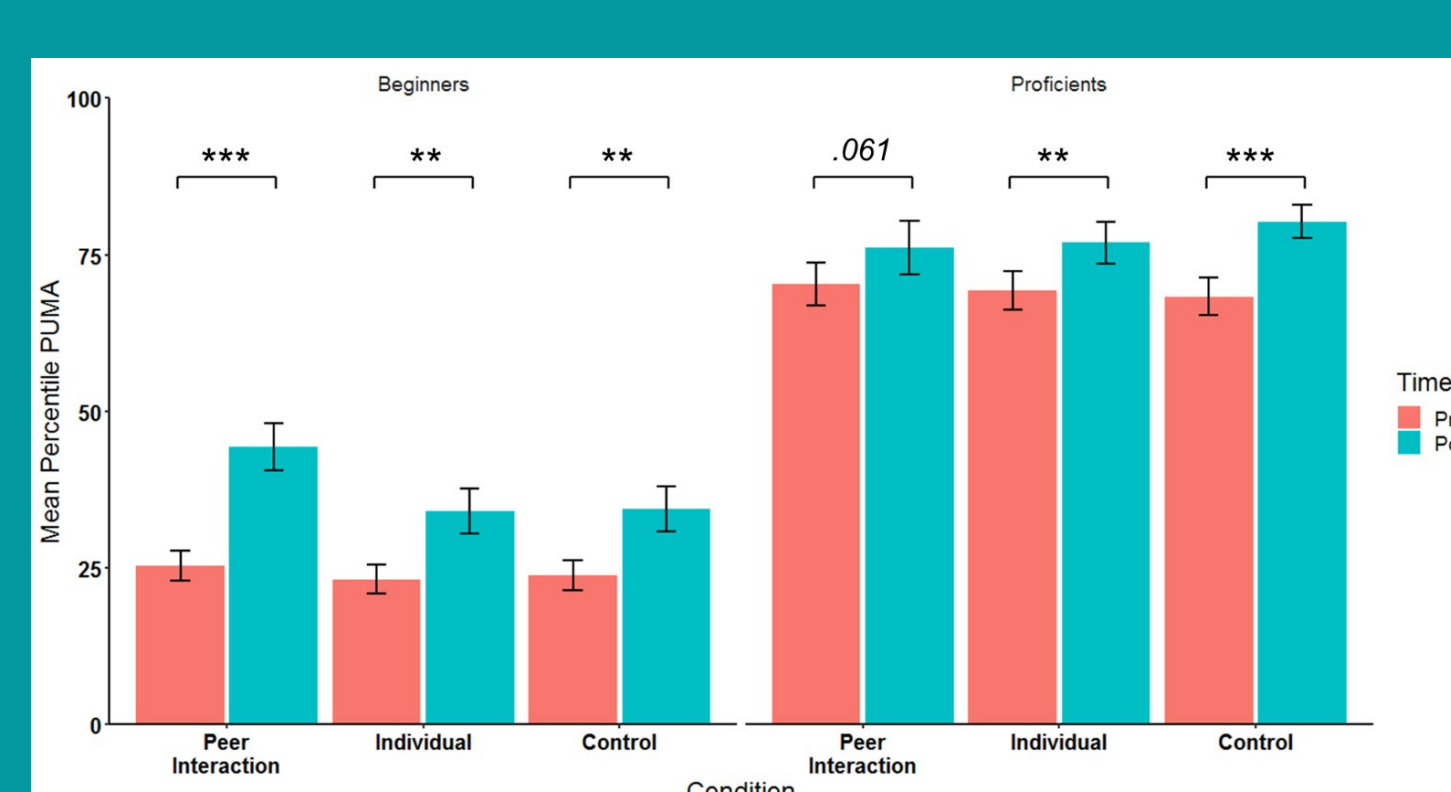


Mean percentile in PUMA for each condition



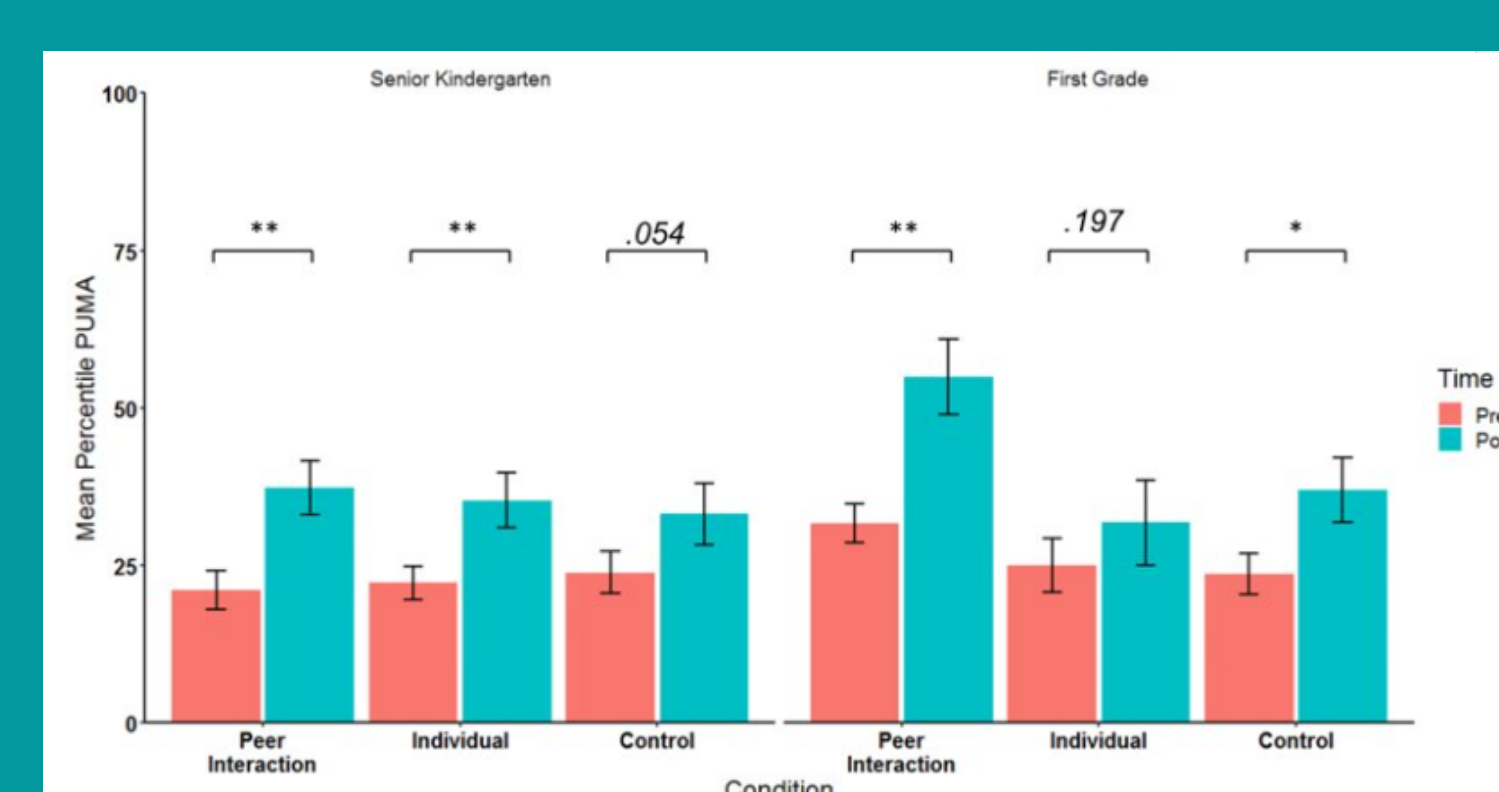
Peer Interaction group ($t(52) = -5.60$; $p < .01$; $d = -0.54$) shows a **medium effect** size while Individual and control shows a **small effect** size.

For low and high math proficiency



For beginners we found a **large size** effect in peer interaction condition while the other two groups there is a **medium effect** size.

For beginners in k5 and first grade



The intervention seems to improve outcomes specially for beginners students in first grade.

Discussion

In this study, we tested a math intervention with senior kindergarten and first grade children. Although the results show a significant advance for all groups, it is interesting to note that the largest effect found was in the peer interaction group when children perform previously poorly in mathematics. This result highlights the importance of interactions between children for learning. Future directions should be focused on the understanding of the mechanisms through which interactions promote learning.

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- Tokac, U., Novak, E., & Thompson, C. G. (2019). Effects of game-based learning on students' mathematics achievement: A meta-analysis. *Journal of Computer Assisted Learning*, 35(3), 407-420.
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- Thai, K. P., Bang, H. J., & Li, L. (2022). Accelerating early math learning with research-based personalized learning games: A cluster randomized controlled trial. *Journal of Research on Educational Effectiveness*, 15(1), 28-51.